АСТРОФИЗИКА

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FIRST BYURAKAN SPECTRAL SKY SURVEY. STARS OF LATE SPECTRAL TYPES. XII. ZONE $-3^\circ \le \delta \le +1^\circ$

K.S.GIGOYAN[1], H.V.ABRAHAMYAN[1], M.AZZOPARDI[2], D.RUSSEIL[2]

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The twelfth list of faint late M and carbon type stars detected on the plates of the First Byurakan Spectral Survey in zone $-3^\circ \le \delta \le +1^\circ$ covered about 1070 sq. degrees is presented. From 86 detected stars, 57 are newly discovered objects: they are 3 R - type carbon stars, 2 carbon star candidates and 52 M - type stars. Among the latter 34 (28 PSC + 6 FSC) are unclassified IRAS sources. Equatorial coordinates, spectral classes, color indices and red magnitudes determined from the Palomar E-charts are presented.

1. *Introduction.* This is the continuation of the detection and listing of relatively faint late M-type and carbon (C) stars at high Galactic latitudes on the basis of the low - dispersion material, provided by the First Byurakan Spectral Sky Survey(FBS) [1] with the aim of clarifying the nature of these objects. Information about FBS and the description of the spectroscopic criteria we used for selecting M-type and C stars on the Schmidt telescope objective - prism plates has been given in earlier papers in this series [2-4]. In addition, subsequent spectroscopic and photometric studies of the newly discovered M and C stars are in progress [5]. In our last paper [4] of present series we reviewed the main works devoted to the faint C and M star studies at high Galactic latitudes.

2. *Photographic Material.* Three zones ($00^h00^m \le \alpha \le 05^h20^m$, $08^h00^m \le \alpha \le 16^h20^m$, and $20^h20^m \le \alpha \le 00^h00^m$) of the $-3^\circ \le \delta \le +1^\circ$ belt corresponding to about 1070 sq. deg. and covered by 67 $4^\circ \times 4^\circ$ fields have been surveyed. From 1967 to 1980 84 photographic plates (Kodak IIF, IIAF, IIaF, and IIF (baked)) have been obtained by Markarian and collaborators [1]. This photographic material was scrutinized three times by K.G. in order to identify C and M stars.

3. *Late - Type Star Identification.* The survey resulted in the identification of 86 objects showing the spectral characteristics of very red stars, including 75 late M-type stars, 9 C stars plus 2 possible C star candidates. Identifications and cross - identifications of these stars have been made using the SIMBAD astronomical database at the CDS (http://simbad.u-strasbg.fr). For this purpose we selected on the Palomar atlas circular areas of 1 arcmin

radius with the nominal position of each object as center.

63 of these 86 very red star candidates appear in various catalogs: among them 29 are known objects and are included in catalogues [6-9], while 34 objects are unclassified IRAS point sources [10,11]. The data of the remaining 23 stars are not contained in existing catalogues.

For 34 FBS stars identified as infrared sources using the SIMBAD database, a cross - identification with IRAS Faint Source Catalogue sources was repeated. For this purpose we took advantage of the remote access, over the Internet, to the XCATSCAN program for automatic IRAS source identification provided by the Infrared Processing and Analysis Center(IPAC) at Pasadena [12]. This led us to generate 4' x 4' field sky maps showing the positional uncertainity ellipse for the nearest IRAS FSC object at the nominal position of each FBS star as center. Comparison with visual sources provided the Palomar Digital Sky Survey (DSS) [13] resulted in a cross - identification for all 34 FBS stars. Note that 28 of them belong to the IRAS Point Source Catalogue [10], while the 6 remaining stars are IRAS FSC [11] sources only. More detaily, identifications of detected faint FBS red stars with the IRAS FSC sources by help XCATSCAN programme are described in last two papers of the present series [4,5].

4. *The Twelfth List of Red Stars*. Data for the 57 newly discovered objects out of the 86 very red stars detected in the aforementioned belt regions covered by the FBS plates are gathered in Table 1, successive column of which presents:

Column 1: Running list number, column 2: FBS designation; column 3, 4: Equatorial coordinates for J2000.0 determined from digital charts of the Palomar Survey (DSS [13] (http://skyview.gsfc.nasa.gov/)), column 5: Rough spectral subtype estimated from the visual scrutinizing of the object spectral features displayed by our low-dispersion objective-prism plates, column 6: Red magnitude determined from Palomar E maps using the diameter-magnitude relationship by King and Raff [14], column 7: Color index determined using Palomar E and O maps and the same method as for the magnitude estimates, column 8: Cross-identification with IRAS PSC [10] and FSC [11] catalogue number, if any.

When necessary, notes on individual stars are given at the end of Table 1. We give finding charts, extracted from the DSS for all C stars and more interesting late M-type stars listed in Table 1.

5. *Conclusion*. In the FBS $-3^\circ \leq \delta \leq +1^\circ$ belt we have identified 86 red stars, 57 of which are newly discovered objects, namely 3 C stars of early types plus 2 C star candidates, and 52 late M - type stars. 34 M star are cross-identified with unclassified IRAS point sources.

Table 1

THE LIST OF THE NEW M AND C STARS

No	FBS designation	Coordinates		Spectral subtype	E Mag.	CI	IRAS PSC [10] and FSC [11] identifications
		α_{2000}	δ_{2000}				
1	2	3	4	5	6	7	8
1	0002+004	00^{h}05^{m}06^s.1	+00° 43' 50"	M5-6	9.7	3.2	PSC 00025+0027
2	0026-001	00 29 13 .8	+00 07 57	C(R)?	15.9	1.3	
3	0319+003	03 22 31 .6	+00 31 47	M5-6	13.7	4.8	PSC 03199+0021
4	0418-029	04 21 20 .5	-02 50 03	M6-7	13.0	2.2	FSC 04188-0257
5	0509-026	05 12 28 .6	-02 33 30	M5-6	10.1	2.7	PSC 05099-0237
6	0514-002	05 17 03 .4	+00 16 15	M5-6	9.7	4.9	PSC 05144-0013
7	0515-009	05 17 51 .7	-00 50 32	M7-8	13.5	3.2	
8	0515+005	05 18 15 .4	+00 34 02	M6-7	13.0	2.9	FSC 05156+0030
9	0521+007	05 23 42 .5	+00 48 33	M5-6	10.0	3.0	PSC 05211+0045
10	0807-020	08 10 28 .4	-02 14 15	M7-8	12.2	3.0	PSC 08079-0205
11	0809-001	08 11 39 .8	-00 19 17	M6-7	12.2	3.0	
12	0810+001	08 12 37 .7	-00 02 13	M7-8	11.0	2.8	PSC 08000+0006
13	0813-017	08 15 52 .4	-01 50 50	M8-9	18.0	2.6	PSC 08133-0141
14	0830-013	08 33 11 .7	-01 30 08	M5-6	12.2	2.4	FSC 08306-0119
15	0837+008	08 40 03 .5	+00 37 12	M5-6	12.2	3.0	
16	0837-011	08 40 30 .8	-01 16 37	M5-6	10.8	2.2	PSC 08379-0105
17	0858-013	09 00 48 .2	-01 33 41	M6-7	11.0	2.0	PSC 08582-0121
18	0903+009	09 06 04 .9	+00 44 38	M5-6	12.2	3.0	
19	0945-006	09 48 07 .6	-00 51 43	M6-7	9.7	3.0	PSC 09455-0037
20	0954-023	09 57 23 .3	-02 33 10	M7-8	13.0	4.6	PSC 09548-0218
21	0959-019	10 01 45 .6	-02 13 17	M5-6	11.0	3.6	PSC 09592-0158
22	1021-024	10 23 55 .5	-02 44 17	M6-7	10.0	2.6	
23	1032-000	10 34 56 .0	-00 20 39	M8-9	11.0	3.0	
24	1138-000	11 41 29 .0	-00 21 28	C(R)?	13.5	2.0	
25	1145-000	11 47 59 .8	-00 19 18	C(R)	12.2	2.0	
26	1552-002	15 54 46 .0	-00 25 51	C(R)	10.5	1.3	
27	1558-000	16 01 05 .6	-00 13 09	M6-7	12.2	2.4	
28	1558-008	16 01 25 .8	-00 59 59	M7-8	13.5	3.2	
29	1601-009	16 04 04 .1	-01 06 11	M5-6	12.5	3.4	PSC 16013-0057
30	2020-021	20 23 28 .4	-01 56 05	M6-7	13.0	2.0	
31	2020-000	20 23 27 .8	+00 05 41	M5-6	11.0	2.5	PSC 20208-0004
32	2021-018	20 23 43 .9	-01 37 40	M6-7	12.2	3.0	PSC 20211-0147
33	2022+001A	20 24 55 .9	+00 20 33	M6-7	12.2	2.4	
34	2022+001B	20 25 29 .5	+00 17 55	M4-5	13.0	1.8	PSC 20229+0008
35	2023+003	20 25 34 .9	+00 29 05	M5-6	12.0	2.0	FSC 20230+0019
36	2023-027	20 26 34 .3	-02 32 32	M7-8	12.8	2.4	FSC 20239-0242
37	2024-017	20 26 59 .3	-01 35 54	M7-8	12.8	2.2	PSC 20243-0145
38	2026-009	20 29 23 .9	-00 49 03	M8-9	14.0	2.7	PSC 20268-0059
39	2028-001	20 31 08 .4	+00 01 22	M7-8	13.5	2.4	
40	2028-026	20 31 27 .3	-02 26 41	M6-7	12.8	3.1	PSC 20288-0236
41	2030+001	20 32 41 .2	+00 16 51	M6-7	12.5	3.0	PSC 20301+0006
42	2031-010	20 34 13 .3	-00 50 24	M8-9	12.2	3.7	PSC 20316-0100
43	2035-027	20 38 16 .3	-02 42 54	M6-7	12.8	2.4	
44	2042-004	20 45 08 .8	-00 16 32	M5-6	12.2	2.4	PSC 20426-0027
45	2045-024	20 48 19 .4	-02 15 58	M5-6	12.8	2.9	PSC 20457-0227
46	2046-010	20 49 10 .6	-00 50 47	M6-7	13.5	3.2	PSC 20465-0102

Table 1 (continued)

1	2	3	4	5	6	7	8
47	2053-015	20 55 56.3	-01 21 12	M5-6	10.0	2.6	PSC 20533-0132
48	2053-022	20 56 28.4	-02 00 50	M5-6	13.5	1.7	
49	2056-018	20 59 18.2	-01 39 49	M7-8	11.0	3.7	PSC 20567-0151
50	2106+010	21 08 47.6	+01 10 14	M6-7	12.2	1.8	
51	2110+004	21 13 27.5	+00 39 59	M4-5	12.6	2.8	
52	2115-010	21 18 00.3	+01 08 27	M4-5	12.2	2.4	
53	2116-020	21 19 33.4	-01 51 06	M4-5	12.8	2.8	
54	2117-009	21 19 35.6	-00 43 55	M6-7	12.2	2.8	
55	2120+005	21 22 47.9	+00 44 16	M6-7	12.0	2.6	PSC 21202-0031
56	2211+004	22 14 16.2	+00 42 48	M5-6	10.8	3.0	FSC 22117+0027
57	2217-009	22 19 42.9	-00 39 50	C(R)	10.8	2.2	

Notes to Table 1.

0026-001: Faint low - dispersion objective-prism spectrum at the edge of the FBS plate; star of probable R subtype.

0319+003: From the FBS plate this object is estimated as $m_V \approx 12.0 - 13.0$. Obviously a variable M star.

0810+001: $m_V \approx 13.0 - 13.5$. Absorption bands of TiO moleculae is very well visible.

0813-017: $m_V \approx 14.0 - 14.5$. This star is on the edge on Palomar Atlas O chart. Obviously a variable M star.

0954-023: In the digitized APS (http://isis.spa.umn.edu/) data base the following data are presented for this star, $m(E) = 13.3$, and $m(O) = 18.28$. There are probably a dense gas-dust shell around this object.

1138-000: $m_V \approx 14.0 - 14.5$. In the digitized APS data base this object is erronously classified as a galaxy.

1145-000: A star of early R subtype.

1552-002: Judging from the color index, the object can be assumed to be a star of early R subtype.

2053 - 002: The APS classification is erronously given as a galaxy.

2217 - 009: A star of early R subtype.

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[1] V.A.Ambartsumian Byurakan Astrophysical Observatory, Armenia
[2] Observatoire de Marseille, France

ПЕРВЫЙ БЮРАКАНСКИЙ СПЕКТРАЛЬНЫЙ ОБЗОР НЕБА. ЗВЕЗДЫ ПОЗДНИХ СПЕКТРАЛЬНЫХ КЛАССОВ. XII. ПОЛОСА $-3^\circ \le \delta \le +1^\circ$

К.С.ГИГОЯН[1], Г.В.АБРАМЯН[1], М.АЗЗОПАРДИ[2], Д.РУССЕЙ[2]

Приводится двенадцатый список слабых углеродных и М-звезд, выявленных на пластинках Первого Бюраканского спектрального обзора неба в полосе $-3^\circ \le \delta \le +1^\circ$ с площадью около 1070 кв. градусов на высоких галактических широтах. Из 86 отобранных звезд 57 открыты впервые. 3 объекта являются R - звездами, 2 - кандидатами в С - звезды. Из 52 М-звезд 34 идентифицированы с неизвестными точечными источниками IRAS, причем 28 являются PSC-источниками, а 6 FSC-источниками. Для новых объектов даются экваториальные координаты, спектральные классы, цветовые характеристики и звездные величины, определенные на Паломарских Е - картах.

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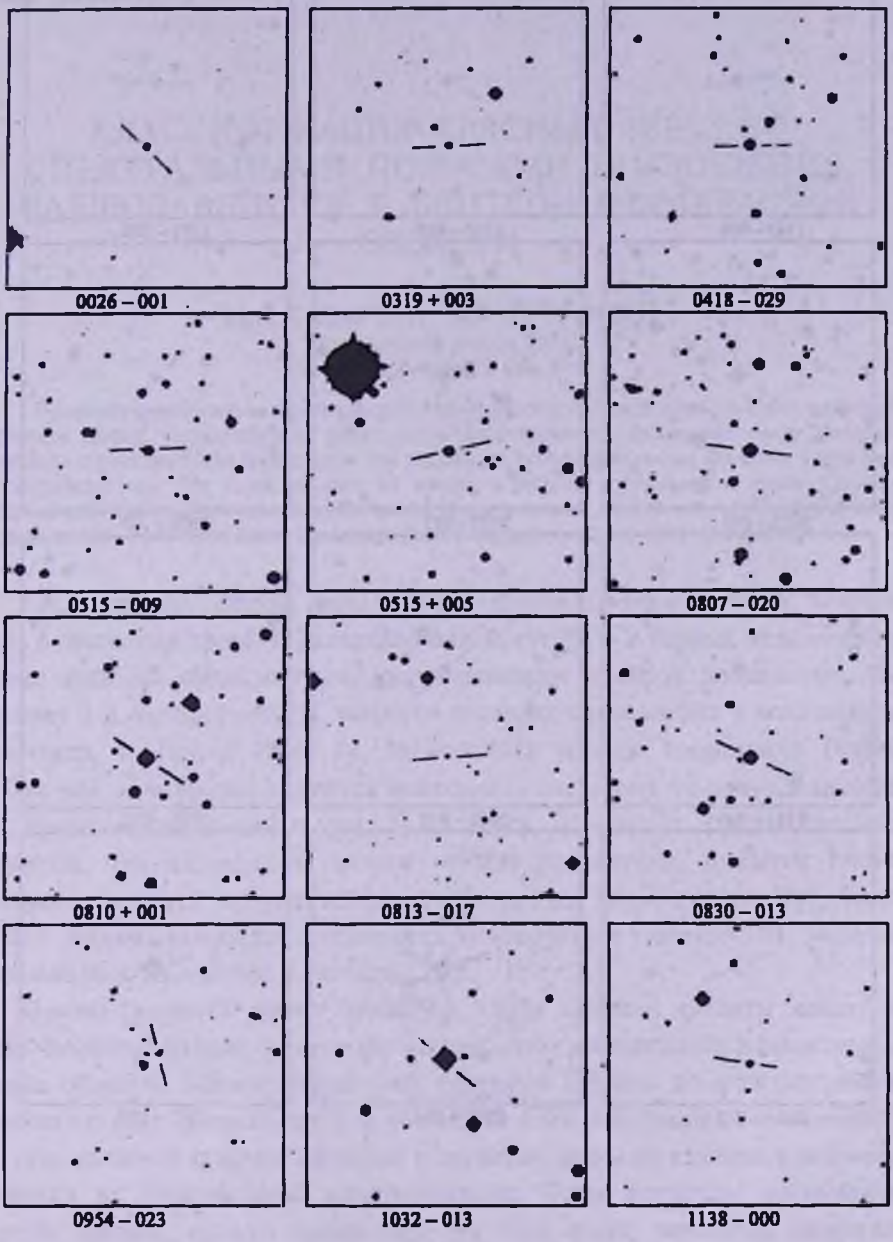
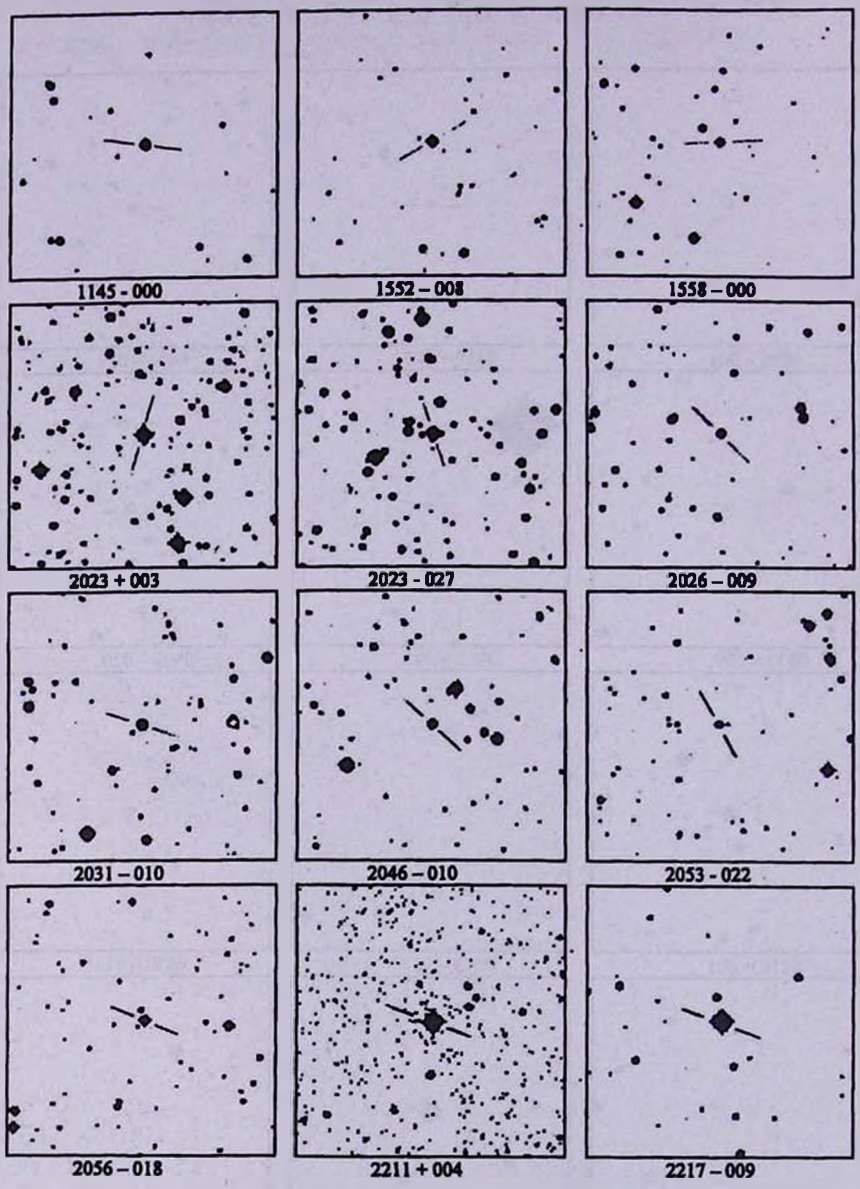
FINDER CHARTS FOR FBS RED STARS

(North is Up, East is Left, 5' x 5')




1145 - 000
1552 – 008
1558 – 000
2023 + 003
2023 - 027
2026 – 009
2031 – 010
2046 – 010
2053 - 022
2056 – 018
2211 + 004
2217 – 009